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Relationship between progress of borehole investigations and the geometric data of fractures at the crystalline rocks

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In order to evaluate deep geological environment for geological disposal of high level radioactive waste (HLW) and underground storage of liquefied petroleum gas, understanding of the geometry of water conducting features such as fractures is essential. Geometric data of fractures are obtained by borehole investigations. But, methodology to understand the geometry of fractures has not been established in terms of planning borehole investigation such as number and total length of boreholes. Thus, relationship between progress of borehole investigation and increase of the geometric data of fractures is studied.

In this study, discrete fracture network models with the size of 100×100×100m cube were used as virtual fractured rock mass, and virtual boreholes were drilled in the virtual rock mass. Five boreholes with the length of 100m each were located in four directions. One dimensional fracture intensity (as the number of fractures per unit length; P10) of virtual boreholes is calculated. The P10 is depending on the relationships borehole directions and fracture orientations. In addition, The P10 is become constant at each direction of borehole as investigations progressed.

These results suggest that in order to obtain the geometric data of fracture, the borehole investigation should be planned in consideration of distribution of the fracture orientations.

Keywords: Borehole investigation, DFN model, Methdology, Fracture intensity